Spring, 2007

EECS70A / CSE 70A Network Analysis I
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Midterm II solution

Problem 1:

Criteria: (a) $V_o / V_s = 0.05$ and (b) $R_{eq} = 40\ k\Omega$

From the circuit, $R_{eq} = R_1 + R_2 \parallel 5\ k\Omega = 40\ k\Omega$

Using voltage divider: $V_o = V_s . (R_2 \parallel 5\ k\Omega) / (R_1 + R_2 \parallel 5\ k\Omega)$

$V_o / V_s = (R_2 \parallel 5\ k\Omega) / (R_1 + R_2 \parallel 5\ k\Omega) = 0.05$

$(R_2 \parallel 5\ k\Omega) = 0.05 \times 40\ k\Omega = 2\ k\Omega$

$(R_2 \times 5\ k\Omega) / (R_2 + 5\ k\Omega) = 2\ k\Omega$

$R_2 = 0.4\ R_2 + 2\ k\Omega$

$\therefore R_2 = 3.3\ k\Omega$

$\therefore R_1 = 40\ k\Omega - R_2 \parallel 5\ k\Omega = 38\ k\Omega$

Problem 2:

To have maximum possible power supplied to the load, $R_{Th} = R_L = 10\Omega$

$Wmax = V_{Th}^2 / 4R_{Th} = (40)^2 / (4 \times 10) = 40\ W$

Problem 3:

$10\mu F + 1 / (1/C + 1/20\mu F) = 20\mu F$

$1/C + 1/20\mu F = 1/ 10uF$

$\therefore C = 20\mu F$

Problem 4:

$R_{Th} = 10\Omega \parallel 40\Omega = 8\Omega$

$V_{Th} = 20\ V \times (40\Omega / (40\Omega + 10\Omega)) = 16\ V$

Problem 5:

$v_o = -1\ V$